

March 2, 2016

Town of Amherst, MA WWTP

NPDES Permit No. MA0100218

APRIL 1, 2016 NITROGEN REMOVAL REPORT

Nitrogen Removal first appeared on our permit in September 2012 with a limit for an annual average of 546.5 lbs. /day Total Nitrogen. The year prior to our current permit (2011-2012) our Total Nitrogen in our discharge was 840 lbs. /day. Successful results of our first few years continues, with this past season resulting in an annual average of 465.2 lbs. /day total nitrogen. Our goal is to improve upon those numbers each year.

We still continue to accomplish nitrogen removal by using instrumentation, process control, Supervisory Control and Data Acquisition (SCADA) and no chemical addition. We no longer utilize a nitrogen consultant. Grant Weaver from The Water Planet had been retained under contract until August 31, 2014. Our average daily flow during this past nitrogen season was 3.69 MGD. The Activated Sludge Process has 9 (nine) mechanical Aerators and 1.872 MG of Aeration Basin volume.

Seven of the nine Aerators have dedicated Hach ORP and DO probes. This data is fed to the SCADA system which in turns gives us live analog data and trend charts. A program was written to allow the operations staff control of DO set points, aerator speeds, and on and off aerator cycles. As microorganisms, food wastes and NH₃-N flow thru the Aeration Process, this continuous plug flow encounter Aerobic and Anoxic zones to convert Ammonia Nitrogen to Nitrogen gas.

Amherst being a college town presents many challenges with nitrogen removal. Loadings such as flows, BOD and incoming nitrogen levels change every weekend, holiday, semester break and summer. This past season presented the additional challenge of having the coldest recorded average temperature in February on record, which resulted in the loss of our nitrification process until the warmer spring months. Based upon that event, we chose not to drop down to 6 aerators during this winter's semester break. We are maintaining longer sludge retention times (SRT) based on aeration temperature to insure that

adequate nitrifying bacteria are present. The decision was also made, to waste sludge from the system 6 days a week instead of the previous 5 days a week. Again, trying to maintain a more linear SRT thru out the week. As we amass more and more seasonal data, we utilize the positive resulting process control data point's and apply it to the following year.

For bi- weekly permit reporting of nitrogen data we collect a 24 hour composite sample beginning on Monday's and Wednesday's and perform the testing on Tuesday's and Thursday's. Our lab performs daily week day testing for NH₃-N, NO₂-N, NO₃-N and pH for process control. Twice/week testing is performed for Alkalinity and TKN.

- F/M Range : 0.10 - 0.15
- MCRT Range : 14 - 16 days
- DO set point range : 1.5 - 2.0 ppm
- Aerobic "ON" Cycles Range : 70 - 180 minutes
- Anoxic "OFF" Cycles Range : 60 - 135 minutes
- 9 Aerators On-line : High loadings - 8 months of the year
- 6 Aerators On-line : low loadings - 4 months of the year

We still are incorporating one 5hp that is capable of returning 600 -800 GPM of aeration outfall back to the inlet box of aeration to help recycle some nitrates.

Running additional Mechanical Aerators has resulted in more annual electrical costs. However, running longer sludge ages may help us save back some money by producing less dry tons of bio solids. We find that Nitrogen removal makes for an interesting operation challenge with the variables that the Amherst Wastewater Facility presents. Our goal still remains the same, to reduce Total Nitrogen without chemical addition or bio augmentation, all while maintaining quality effluent.

Sincerely

Duane Klimczyk,

Amherst Wastewater Division Director

Nitrogen Testing Laboratories 2014/2015

Contract labs:

MICROBAC LABORATORY

61 Louisa Viens Drive,

Dayville, CT 06241

Phone (800)334 – 0103

AMHERST WWTF LABORATORY

100 Mullins Way,

Hadley, Ma 01035

Phone (413) 259 – 3055

Permission for the Amherst Wastewater Treatment Facility laboratory to analyze TKN in wastewater for reporting using the Hach Method 10242 was granted by EPA and MASSDEP. EPA's approval letter, dated January 16th, 2014, is on file in the laboratory. Relevant correspondence from MASSDEP is also in the file.

Permission to analyze N03 in wastewater for reporting using the Hach Method 10206 was also approved by EPA and MASSDEP. This method is equivalent or better in performance to sm 4500-N03-E, and EPA 353.2 for purposes of regulatory reporting of nitrates. From January 16th, 2014 to the present our Amherst WWTF laboratory is performing all nitrogen testing in house for reporting.

CURRENT NITROGEN TESTS AND METHODS

TKN: HACH METHOD 10242, s-TKN simplified spectrophotometric Measurement

AMMONIA-NITROGEN: HACH Method 10205, salicylate Method

NITRATE: Hach Method 10206, dimethyl phenol Method

NITRITE: Hach Method 10207, diazotization Method

TOTAL NITROGEN: Calculated by adding TKN, NO2 and N03 results

Nitrogen Monthly Totals

Town of Amherst
Amherst WWTP Laboratory Data

Month	Pounds/ Month	Number of Tests/Month
Sep-14	4550.0	9
Oct-14	4131.0	9
Nov-14	3057.0	6
Dec-14	3401.0	8
Jan-15	3832.1	8
Feb-15	6323.4	7
Mar-15	8018.2	9
Apr-15	6304.2	9
May-15	1970.2	8
Jun-15	1747.2	9
Jul-15	1226.0	8
Aug-15	1027.0	8

Average
Pounds/D
ay/Year

465.2

Amherst Effluent Nitrogen Data

MONTHLY AVERAGE

Amherst WWTP Laboratory

Month	Ammonia mg/L				Nitrite mg/L				Nitrate mg/L				TKN mg/L				Total N mg/L				Lbs./Day of N			
	2012/ 2013	2013/ 2014	2014/ 2015	2015/ 2016	2012/ 2013	2013/ 2014	2014/ 2015	2015/ 2016	2012/ 2013	2013/ 2014	2014/ 2015	2015/ 2016	2012/ 2013	2013/ 2014	2014/ 2015	2015/ 2016	2012/ 2013	2013/ 2014	2014/ 2015	2015/ 2016	2012/ 2013	2013/ 2014	2014/ 2015	2015/ 2016
September	22.3	12.6	8.7	4	0.3	0.4	0.3	0.5	3.2	3.6	5.3	4.3	23.7	15.3	11.2	6	27.9	19.1	16.7	10.7	1040.9	591.9	505.6	328
October	18.7	13.9	6.2	3.4	0.3	0.3	0.2	0.5	2.8	5.5	6.5	5.5	20.7	16.6	7.8	5.1	24.3	22.3	14.6	10.8	945.7	674.8	459.0	342.4
November	11.5	8.5	5.4	4.2	2.1	0.3	0.3	0.5	3.5	7.7	6.8	5.3	16.1	11.0	7.7	5.7	20.9	18.6	14.6	11.6	739.2	556.0	487.5	331.4
December	3.5	4.3	3.9	6.5	2.2	0.2	0.1	0.5	3.7	6.5	4.5	3.6	6.9	6.3	4.8	7.1	12.7	12.8	9.2	11.2	433.3	389.5	373.9	319.1
January	6.5	8.3	13.4	8	3.0	0.2	0.1	0.1	2.7	4.0	3.7	3.7	10.5	10.8	10.3	9.7	16.2	14.8	14.0	13.6	570.0	513.8	459.4	416.4
February	2.9	11.3	25.8		4.8	0.2	0.1		3.9	6.0	2.4		8.7	14.7	26.5		17.3	20.9	28.9		714.6	687.2	915.5	
March	3.8	5.5	20.2		1.9	0.2	0.1		4.0	7.5	2.6		6.8	7.9	21.4		12.6	15.7	24.1		556.7	584.4	890.9	
April	10.3	6.6	12		0.5	0.1	0.2		1.9	4.6	4.2		13.3	8.7	12.1		15.7	13.5	16.2		568.7	659.1	700.5	
May	2.9	2.8	4.1		0.7	0.2	0.2		1.2	4.5	4.1		4.2	4.7	4.7		6.2	9.5	5.1		185.0	395.1	246.3	
June	3.1	0.8	3		0.3	0.2	0.2		1.0	4.8	3.9		4.4	2.4	3.8		5.8	7.4	8.0		232.5	192.2	194.1	
July	4.1	1.4	1.7		0.2	0.2	0.3		2.2	4.2	3.5		5.2	2.8	2.6		7.3	7.3	6.4		219.8	187.2	155.2	
August	3.8	2.9	0.9		0.3	0.3	0.4		3.2	3.5	3.9		5.2	4.6	1.9		8.6	8.3	6.1		207.0	208.2	128.2	
Annual Average	7.8	6.6	8.8	5.2	1.4	0.2	0.2	0.4	2.8	5.2	4.3	4.5	10.5	8.8	9.6	6.7	14.6	14	14	11.6	534.5	470.0	459.7	347.5